two months, give the required number, commonly called "*v*," within $^1/_2$ per cent. of 300,000 kilometres per second; the velocity of light is known to be within $^1/_4$ per cent. of 300,000 kilometres per second. Results of previous observers for determining "*v*" had almost absolutely proved at least as close an agreement with the 300,000,000 metres as this. He expressed his obligations to his assistants and students in the Physical Laboratory of Glasgow University, Messrs. Meikle, Shields, Sutherland, and Carver, who worked with the greatest perseverance and accuracy, in the laborious and often irksome observations by which he had attempted to determine "*v*" by the direct electrometer method, as exactly as, or more exactly than, it has been determined by other observers and other methods.

The measurement of "*v*" by Sir William Thomson and Profs. Ayrton and Perry, communicated to the British Association at Bath, was too small (292) on account of the accidental omission of a correction regarding the effective area of the attracted disk in the absolute electrometer. When this correction is applied their result is brought up to 298, which exactly agrees with Profs. Ayrton and Perry's previous determination by another method, in Japan. Prof. J. J. Thomson's result is 296·3. It is understood that Rowland has found 299. The result of Sir William Thomson's latest observations, founded wholly on the comparison of electrometric and electro-magnetic determinations of potential in absolute measure, is 30·1 legal ohms, or 30·04 Rayleigh ohms. Assuming, as is now highly probable, that the Rayleigh ohm is considerably nearer than the legal ohm to the true ohm, the result for "*v*" is 300,400,000 metres per second. Sir William does not consider that this result can be trusted as demonstrating the truth within $^1/_3$ per cent.

NOTES.

THE Royal Society's Bakerian Lecture for the present year is to be "On a Magnetic Survey of the British Isles for the epoch January 1, 1886," by Prof. A. W. Rücker, F.R.S., and Prof. T. E. Thorpe, F.R.S.

CAPTAIN W. J. L. WHARTON, R.N., F.R.S., Hydrographer to the Admiralty, has been elected a member of the Athenæum Club, in accordance with the rule which empowers the Committee to elect annually a certain number of persons of distinguished eminence in literature, science, or art, or for public services.

THE American Association for the Advancement of Science will meet this year at Toronto from August 27 to September 3. It is expected that the attendance will rival that at the Boston meeting of 1880. The President of the Association is Prof. Mendenhall. Major Powell, as retiring President, gives the address.

THE French Association for the Advancement of Science will meet at Paris from August 8 to 15.

THE French Ministry of Public Instruction has decided to create a laboratory of pathological physiology at the École des Hautes Études, Paris. The Director will be M. François-Franck, assistant of M. Marey at the Collège de France.

DR. SELMAR SCHÖNLAND, of the Botanic Garden, Oxford, has been appointed to the Curatorship of the Albany Museum, Grahamstown, Cape Colony.

IN the spring, M. Hasselberg will go from Pulkowa to Stockholm, having been elected Fellow of the Royal Academy of Sciences, and Director of the Physical Institution of the Academy, in succession to Prof. Edlund.

THE Bombay Anthropological Society has resolved to communicate with the executors of Mr. E. T. Leith, the founder o the Society, with a view to secure the publication of his literary remains under the supervision and at the expense of the Society.

FURTHER experiments are to be carried out shortly at Chatham by the Balloon Department with the Bruce system of electric balloon signalling. The apparatus used will be that which the Government purchased of the inventor, Mr. Eric Stuart Bruce.

WE regret to hear of the death of Captain John Ericsson, the famous Swedish engineer. He died the other day at New York, at the age of eighty-six. Captain Ericsson was a man of extraordinary intellectual resource, and his name stands high among the great inventors of the present century. An effective screw-propeller was invented independently both by him and by Francis Pettit Smith. Smith's patent was taken out in May 1836, a little before Ericsson's; but the date of Ericsson's invention was considerably earlier than that of his English rival. The screw-propeller of Ericsson was at once adopted by the United States Navy, but in England he had the mortification of being officially informed that it was useless, because, "the power being applied at the stern, it would be absolutely impossible to make the vessel steer." Afterwards he had occasion to learn that an inventor's difficulties may be not less formidable in the New World than in the Old, for he was badly treated in connection with the *Princeton* screw steamer, designed by him for the United States Government in 1844, and in connection with the *Monitor*, which he built during the Civil War. During his last years he was much occupied with what he called "the sun motor," an article on which, by himself, recently appeared in NATURE (vol. xxxviii. p. 319).

DR. JOHN CALL DALTON, the physiologist, died at New York on February 12, at the age of sixty-four.

AFTER the ordinary meeting of the Royal Meteorological Society, at 25 Great George Street, Westminster, on Wednesday, the 20th inst., the Fellows and their friends will inspect the Society's tenth annual Exhibition of Instruments. The Exhibition will remain open until Friday, the 22nd inst. It promises to be very interesting and instructive. It will be specially devoted to actinometers and solar radiation apparatus, but will also include several new instruments, and a number of photographs of flashes of lightning, clouds, &c. Persons, not Fellows, wishing to visit the Exhibition, can obtain tickets on application to Mr. W. Marriott, Royal Meteorological Society, 30 Great George Street, S.W.

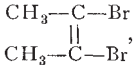
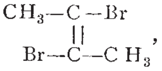
WE have received, from the Meteorological Reporter to the Government of India, the "Registers of Original Observations" made at seven selected observatories during the months of January to July 1888. These observations, although not exactly in the form prescribed, are published in pursuance of a decision of the Meteorological Congress held at Vienna in 1873, that each country should publish daily observations for a certain number of stations. The Indian observations have been published in this monthly form since January 1879, while for the years 1875–78 they formed an appendix to the Annual Reports. They contain complete information of all the principal elements for four hours daily, together with daily means, and monthly means for each of the four hours. The registers also contain means of the chief elements for each hour of the day at Alipore (Calcutta), and the hourly movement of the wind at Lucknow and Nagpur. The more rapid dissemination of the information by the publication of monthly parts, instead of annual volumes, renders it more valuable to persons interested in meteorological investigations.

M. KLOSSOVSKI, who published some time ago an important work on the thunderstorms of Russia, has now made another valuable contribution to the meteorology of South

Russia, dealing with the amounts of rain and snow in the Governments of Kherson and Bessarabia (Memoirs of the Odessa Society of Naturalists, vol. xiii. Part 1). Pluviometric observations were made in 1887 at 158 stations, and 1160 descriptions of thunderstorms have been sent in. It appears that the average yearly amount of rain and snow in the Government of Kherson is about 411 millimetres (434 millimetres at Odessa), a line drawn from the mouth of the Dniester to Orenburg separating the regions which receive more than 400 millimetres of rain every year from those in the south which have less than that. The Caucasus shore of the Black Sea, with its heavy rains (1500 to 2000 millimetres every year), makes, of course, an exception to the rule. The rains and the snow are usually brought to Bessarabia by cyclones, those which come from the south bringing with them the heaviest rains. No fewer than 96 per cent. of the cyclones which come from Hungary and the Balkan Peninsula are sure to bring with them more or less heavy rains to Kherson, and the like is true of 51 per cent. of those which follow a course to the south of Odessa altogether. The approach of cyclones can be easily foreseen, but the changes of weather are so sudden in South Russia that storm-warnings ought to be given from Odessa instead of St. Petersburg.

AN earthquake was noticed at Kasina, in Croatia, on February 23. At Aquila, in the Abruzzi, on February 28, five shocks occurred between 4 and 5 a.m. No damage was done.

A SLIGHT shock of earthquake occurred in Eastern Pennsylvania on March 8. It was felt at Lancaster, Harrisburg, Gettysburg, and their environs, and also at Wilmington (Delaware), and several places in Maryland and New Jersey.

ANOTHER beautiful instance of the formation of geometrical isomers, compounds precisely similar in constitution, and differing only in the relative position of their atoms in space, has been discovered by Prof. Wislicenus and Herr Hölz. The compound in question is dibromide of crotonylene, $CH_3—CBr{=}CBr—CH_3$. Crotonylene itself, $CH_3—C{\equiv}C—CH_3$, is the third member of the acetylene series of hydrocarbons, and combines directly with bromine to form a dibromide of the above constitution, which is now shown to have its atoms arranged in space in the manner  $\begin{array}{l} CH_3—C—Br \\ \quad\;\; \| \\ CH_3—C—Br \end{array}$, the two similar groups being symmetrical to an imaginary plane lying between them. On attempting, however, to prepare crotonylene dibromide from the tetrabromide by abstraction of two atoms of bromine, or from one of the tribrombutanes, $CH_3—CHBr—CBr_2—CH_3$, by splitting off a molecule of hydrobromic acid, quite a different substance was obtained. Analyses indicated exactly the same empirical formula as before, but the boiling-point was found to be about 3° higher than that of the first isomer, and its behaviour with zinc dust was markedly different. These facts can only be explained on the supposition that its arrangement in space differs in being centro-symmetrical,  $\begin{array}{l} \;\;\;\;CH_3—C—Br \\ \qquad\quad\;\; \| \\ \;\;Br—C—CH_3 \end{array}$, and this second isomer is therefore termed iso-crotonylene dibromide. Both compounds combine directly with a further quantity of bromine to form the same crystalline tetrabromide, $CH_3—CBr_2—CBr_2—CH_3$. In order to prepare the ordinary compound, the equivalent of a molecule of liquid bromine is allowed to drop from the fine jet of a dropping-funnel into a quantity of crotonylene contained in a flask surrounded by a freezing mixture, as crotonylene boils at 18° C. The reaction is very violent, each drop producing loud hissing; the product is washed with soda, dried over calcium chloride, and distilled. After two fractionations, the dibromide is obtained boiling constantly between 146° and 147°. On the addition of another molecule of bromine, the whole solidifies in large octahedral crystals of the tetrabromide. The iso-compound is best obtained by dropping in a similar manner one molecular equivalent of bromine into cooled monobrom-butylene; distillation of the resulting product yields tribrom-butane. This is diluted with alcohol, and a molecular equivalent of sodium ethylate added: a most violent reaction again occurs with elimination of a molecule of hydrobromic acid. On addition of water, the iso-compound is precipitated as an oil, which, on drying and subsequent distillation, is found to boil constantly between 149° and 150°. Addition of another molecule of bromine resulted in the production of octahedral crystals of the tetrabromide identical with those given by the ordinary compound. On reduction of each of the compounds in alcoholic solution with zinc dust, the plane-symmetrical ordinary compound is much more rapidly attacked than the centro-symmetrical iso-dibromide; when the reaction in each case was allowed to proceed under the same conditions for one hour, 99·6 per cent. of the ordinary compound was converted back to crotonylene, while only 60·6 per cent. of the iso- had been attacked.

THE Bureau des Longitudes has just issued an extract from the *Connaissance des Temps* (1890), for the use of schools of hydrography and aspirants to the grade of captain, either for coasting or ocean service, a recent resolution of the Minister of Marine having rendered such an extract very desirable. It contains the tables of the rising and setting of the sun and moon, and the place of the sun and sidereal time at mean noon for each day of the year. The moon's position is given only for every twelve hours throughout the year, instead of for every hour as in the complete edition, and the tables of lunar distances have been reduced to one star for each day. The positions of only thirty of the principal stars are given, as against 300 in the complete edition. The tables of refraction, and corrections for parallax, are reproduced in full, as are also the tables for conversion of mean time to sidereal time. The positions of the planets, Jupiter's satellites, &c., have been entirely omitted. Useful extracts from the data relating to tides already published in the *Annuaire des Marées* are given, with instructions for their use. The "establishment of the port" for every important port in the world is given, as well as the unit from which the height of the tide can be calculated. Our own authorities would do well to follow the example of the Bureau des Longitudes, and publish a similar extract from the *Nautical Almanac.*

THE Director of the Marine Biological Association reports that the breeding season of a large number of marine animals has begun, and that embryologists may find ample opportunities for study at the sea-side. Of Teleostean fishes, the spawning season of the herring has passed some time since, that of the plaice and flounder is just over, whilst the whiting, whiting pout, and merry sole (*Arnoglossus megastoma*) are now ripe. Nudibranch Mollusks are now visiting the shores to deposit their eggs, and large specimens of *Doris tuberculata* and *Eolis papillosa* may commonly be taken on the rocks at Plymouth. The uncommon *Capulus hungaricus* has been found with ova attached. Among the Crustacea the common shrimp, the prawn, and *Pandalus annulicornis* are hatching out, and the surface net begins to show numerous zoeæ of *Porcellana longicornis.* The Nauplii of Balanus and of Copepods are also abundant at this season of the year. The trochosphere larvæ of Chætopods (*Terebella* and *Phyllodoce*) are beginning to make their appearance, and ova and larvæ of Echinoderms are very abundant, particularly the ova of Ophiura, and Bipinnaria and Pluteus larvæ of Asterids and Echinids. The gonophores of the Hydrozoa are for the most part well developed, and filled with ripe ova during the coming month.

AT a meeting of the Royal Botanic Society on Saturday, a branch of coffee thickly set with ripe fruit from a plant growing in the Society's conservatory was shown. Dr. Prior mentioned as a curious fact that in parts of Abyssinia the fleshy outside husk only was eaten, the part we use being thrown away as worthless.

In the February number of *Himmel und Erde*, Herr O. Jesse, of the Berlin Astronomical Observatory, calls attention to the importance of an accurate study of the luminous night-clouds which, since 1885, have been visible in Europe in the months of June and July. Herr Jesse is of opinion that these phenomena are interesting from an astronomical as well as from a meteorological point of view, because their periodic movement, taken in conjunction with their extraordinary height, suggests that they manifest the activity of cosmical forces. He holds, therefore, that they may throw some light upon the question whether cosmical space is filled with a resisting medium, and that their action may be a repetition of occurrences which played a great part in the earlier period of the development of the earth and of the planets generally. He urges that the phenomena should be carefully observed, and appeals to all who may take this task in hand to send him the results of their observations.

Mr. A. T. Drummond, in recent Canadian publications, takes the view that Lake Superior is the most ancient of the St. Lawrence Great Lakes, dating back to Cambrian and, it may be, earlier times, and that whilst its waters at perhaps more than one period found an outlet to the ocean through the Mississippi valley, the lake formed in other ages one of the sources of a great river system which terminated on the Atlantic seaboard. He traces the course of this river from the Michigan basin, and from Lake Superior across Lake Huron to the headlands at the entrance to the Georgian Bay. Here its waters were hurled over the cliffs in a great fall more than rivalling Niagara. At the lower level another considerable stream joined it from the north, and the united rivers then skirted the face of the continuous, shaly, precipitous cliffs which cross Ontario to the Lake Ontario valley. Following the course of the escarpments which they created in this valley, the waters eventually reached the sea through the Mohawk and Hudson Rivers. At a recent period, the elevation of the land between the Georgian Bay and Lake Ontario blocked the course of the river, and, filling the Georgian Bay with water, created a new outlet, not by the present St. Clair River, which was of later birth, but to the south-eastward of Lake Huron, where, through a channel now buried by clays, the Erie basin was reached. The course from this basin to the Ontario valley was through the great fracture in the limestones at Hamilton, and not over the Niagara Falls. The change in the flow of these waters to the Niagara River was one of the opening episodes in the later history of Lake Erie. The Ottawa River was at this time a large stream flowing much in the same course as now, whilst the St. Lawrence was a less important river, taking its rise in the Adirondack Mountains, which, at their then greater elevation, blocked the present outlet of Lake Ontario.

Mr. Thomas Wilson, of the Smithsonian Institution, Washington, writing in the current number of the *American Naturalist*, gives a rather gloomy account of the treatment accorded by public authorities in the United States to science in general, and to archæology in particular. "The States of Ohio," he says, "or Wisconsin, or West Virginia, or Mississippi, not to mention New York or New England, have either of them within their borders as much unstudied, unsearched, and unclassified archæologic riches as has any one of the great countries of Europe: England, France, Germany, Spain, or Italy. Yet these countries, each of them, do more for archæology than equals the combined efforts of the United States and all the State Governments. I confess to a feeling of depression when, on visiting the Prehistoric Museum at Salisbury, England, I found there stored and displayed, in a beautiful building, erected in the midst of a lovely park, for its sole occupancy, the prehistoric collection of Squier and Davis, gathered by them from the mounds of the United States in the Ohio and Mississippi valleys. It went begging through the United States, knocked at the door of Congress, and besought a purchaser at the ludicrous price of $1000, but without finding a response. And in disgust with their countrymen, and in despair of ever being able to interest their Government or fellow-citizens, they sold their collection to England and retired from the field of archæologic investigation."

We learn from an article in *Science* that the pottery industry in the United States gives employment directly to about ten thousand people, to whom wages amounting annually to four million dollars are paid, this amount being nearly 50 per cent. of the total value of the output of the potteries. In addition to these, there are many thousand more employed in the preparation of the materials for the potters' use, such as mining the clays, quartz, and felspar, and grinding and washing the materials. To these people nearly as much more in wages is paid. According to *Science*, the American potter does not claim to be the peer of his foreign competitor in art productions, but he does claim to equal any foreign manufacturer in the class of china which he produces for the American people—both fine and common "crockery" for domestic uses. "To-day," says *Science*, "the English potter is copying American shapes, designs, and styles of decorations. How different is this state of affairs from that which existed a few years ago, when the American potter depended upon foreign ideas for his shapes and designs! With the development of the manufacturing process, talent for designing shapes and patterns or styles of decoration has likewise progressed, until we have made our own American shapes and designs, which foreigners have been compelled to copy and adopt in order to find a market for their wares in the United States."

In his "Butterflies of the Eastern United States," a part of which we lately reviewed, Mr. Scudder has an interesting paper —Excursus xxiii.—on mimicry and protective resemblance among butterflies. He points out that cases of mimicry are far more common in the tropics than in temperate regions, even relatively. The accounts of travellers in the tropics constantly mention the attacks of birds upon butterflies, while instances of butterflies being seen pursued by birds are vastly more rare in the temperate regions. Mr. Scudder himself has never seen one. In the tropics, moreover, there are many other insectivorous animals, such as lizards. "In our own country, therefore," says Mr. Scudder, "we should not look for many instances of mimicry of any decided type. The most striking is unquestionably that of *Basilarchia archippus*, which mimics *Anosia plexippus*, and the closely related case of *Basilarchia eros* and *Tasitia berenice*, the last two butterflies largely supplanting the first two on the peninsula of Florida. In both these instances the mimicry is enjoyed by both sexes. A third case is found in the less close but still striking mimicry of *Basilarchia astyanax* by the female of *Semnopsyche diana*, an instance the more remarkable as the mimicked species belongs to the same genus as our two other mimicking forms."

At a recent meeting of the Ceylon Branch of the Royal Asiatic Society, two papers were read by Dr. Trimen and Mr. A. P. Green, describing a visit paid by them to Ritigala. Dr. Trimen's paper was devoted to an account of the flora to be found on the mountain, and the difference between it and that of the surrounding country. Ritigala is the highest ground between the central mountains of Ceylon and the mountains of Southern India. It is only 2506 feet high; next to it in height in the central plain of Ceylon being Friar's Hood (2147 feet), Westminster Abbey (1829 feet), and Gunner's Quoin

(1736 feet). Ritigala is completely isolated, and its summit is frequently surrounded by mist, especially during the south-west monsoon—that is, when the plains are suffering severely from drought. The branches of the stunted trees on the mountain are covered with masses of *Meteorium* moss and lichens, like those on the high mountains. Unfortunately the long-continued drought had withered up much of the vegetation, and therefore the expedition was not as productive as it otherwise would have been.

CAPTAIN MOORE, of H.M.S. *Rambler*, has lately described—in a paper read before the China Branch of the Royal Asiatic Society—the appearance and effects of the remarkable "bore" which often occurs in Hangchow Bay. This dangerous visitor is the result of the struggle between the advancing tide in the great estuary and the current of the river. Captain Moore and his officers on several occasions observed the progress of the wave, and their investigations may be summarized as follows:—The rate at which the bore travels varies from ten to about thirteen miles per hour. The height of the bore rarely exceeds 12 or 14 feet, and broken water, in which no small boat could live, follows it for some distance. With the passing of the wave the tide rises many feet in a few seconds; in one instance, observed by Captain Moore, it rose from 9 feet 4 inches below to 4 feet 7 inches above mean level. The rush of the bore was so strong that the force of the waves breaking against the broadside of the *Rambler* sent the water into the mizzen chains and the spray on to the poop. The junks in that region are protected by platforms, with narrow steps cut in the sides. To the north of the estuary is a great sea-wall, built to protect the surrounding country from being flooded by these great tidal-waves. It is thirty-five miles long, and it is strengthened, where the bore strikes most strongly, by an elliptical stone buttress, 253 feet long by 63 feet wide. Behind this the junks are drawn up for shelter.

IN one of the recent American Consular Reports the preparation of Japanese *koji* (yeast) is described by Prof. Georgeson, of the Imperial Agricultural College at Tokio. *Koji* is made not only in special factories, but also in *saké* (rice-beer) breweries. The materials used are water, rice of the common starchy kind only, and *tane* (seed or leaven), the spores of a fungus (*Eurotium oryzeæ*, Ahlb.). It is this latter substance which, when germinating on the rice, changes a portion of the starch into dextrose and dextrin, and produces the fermentation. The rice is carefully washed, and the thin covering of the seed is always removed. It is then allowed to remain for some hours in water, and having been steamed, it is spread on mats to cool, and when the temperature has fallen to about 100° F., the *tane* is scattered uniformly on the mass and then thoroughly mixed with it. The whole is then allowed to remain for eighteen or twenty hours covered with mats, after which the rice is spread in a thin layer in a number of shallow, wooden trays, which are taken to the warmest room in the factory, and there left standing for four or five hours, when the contents are stirred by the hand, and again after an interval of four hours the operation is repeated. On the third day the fungus grows very rapidly, and great heat is generated. Care, however, is taken that the heat does not become too great. This is the usual mode, but there are many other methods.

THE additions to the Zoological Society's Gardens during the past week include a Guinea Baboon (*Cynocephalus sphinx*) from West Africa, presented by Mr. W. J. Vinton; a Valentyn's Phalanger (*Cuscus orientalis* ♂) from the Solomon Islands, presented by Mr. Chas. M. Woodford, C.M.Z.S; an Owen's Apteryx (*Apteryx oweni*), two Tuatera Lizards (*Sphenodon punctatus*) from New Zealand, presented by Capt. C. A. Findlay, R.M.S. *Ruapehu*; two Nuthatches (*Sitta cæsia*), British, presented by Mr. J. Young, F.Z.S.; a Chimpanzee (*Anthropopithecus troglodytes* ♂) from West Africa, two Brown Cranes (*Grus canadensis*) from North America, three Black Swans (*Cygnus nigricollis*) from Australia, a Larger Hill-Mynah (*Gracula intermedia*) from India, deposited; a Hoffmann's Sloth (*Cholopus hoffmanni* ♀) from Panama, six Brent Geese (*Bernicla brenta*), European, purchased.

OUR ASTRONOMICAL COLUMN.

DISTRIBUTION OF SUN-SPOTS IN LATITUDE.—As remarked in the last issue of NATURE (p. 449), spots have been decidedly more numerous in the southern hemisphere of the sun during the last six years than in the northern. Since, however, the two hemispheres were about equally occupied in 1882, and the northern had the decided advantage in 1881 and 1880—whilst for nearly a quarter of a century previous there had been no long-continued difference between the two—it might be supposed that their present predominance in the southern hemisphere was one which would disappear in a series of observations spread over any great number of years. Prof. Spoerer, in a couple of valuable papers which he has just published—"Ueber die Periodicität der Sonnenflecken seit dem Jahre 1618," and "Sur les différences que présentent l'hémisphère nord et l'hémisphère sud du Soleil," the latter appearing in the *Bulletin Astronomique* for February—has given reason for believing that this is not the case, and that there have been at least two considerable periods, previous to the present one, in which the southern hemisphere was by far the more prolific in spots. The first of these was from 1621 to 1625, during which Scheiner's observations give us no spots in the northern hemisphere for 1621 and 1622, very few up to February 1625, and decidedly fewer than in the southern hemisphere until 1626, when a practical equality was established. The second period was in every way a more remarkable one, lasting for more than forty years. We have no record of any northern spots from 1672 to 1704; a few were seen in 1705, but their appearance there was looked upon as a most remarkable circumstance: Cassini and Maraldi recorded that they had never seen spots in the northern hemisphere before; and later, in 1714, on the occasion of the appearance of three northern spots, it was stated in a paper in the *Mémoires* of the Paris Academy that that hemisphere had been free from spots for forty years. This period, 1672–1713, seems to have been an exceptional one from several points of view. For much of the time there seem to have been scarcely any spots visible at all. Cassini, noting the third spot seen in 1676, remarks that in that year they had been more frequent than in the twenty preceding years. Flamsteed, in 1684, says that a spot he saw then was the first he had seen since 1676. Cassini, later on, states that the only spot seen since 1686 was that of May 1688, whilst in 1705 it is recorded ("Histoire de l'Académie," 1795, p. 128) that since Scheiner's observations, made sixty years before, two groups of spots had hardly ever been seen at the same time. Ten years later a similar remark is made; but, in 1716, spots became much more numerous, and as many as eight groups were seen at one time, from August 30 to September 3. The "law of zones," which Prof. Spoerer demonstrated for recent periods, the law that, from minimum to minimum, the spots show a tendency to seek lower and lower latitudes, breaking out afresh in high latitudes directly the next minimum is passed, seems to have been in abeyance during this remarkable period. The mean latitude seems to have been about 8° or 9°, but there was no regular drift downward made evident. The law, as Prof. Spoerer shows in the first of the above-named papers, appears to be unmistakably illustrated by Scheiner's observations at the time of the minimum of 1619, whilst the observations of 1643 and 1644 gave also a low mean latitude previous to the minimum of 1645. Observations at minima since the exceptional period of 1672–1713 supply many illustrations of the law of zones, as Prof. Spoerer takes occasion to demonstrate for the minima of 1755, 1775, 1784, 1833, and 1844.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 *MARCH* 17–23.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)